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4 was measurement of the potential upon introducing the org. component to a surface free of gas. By this means, the occurrence and rate of adsorption, as well as the orientation of the org. compd., could be qualitatively detd. The adsorptive capacity of the Pt for I was studied by electrolytic hydrogenation and indicated the presence of active centers on the Pt. These centers permitted hydrogenation at potentials pos. to the reversible H potential. At equal potentials, electrolytic hydrogenation occurred at a slower rate than catalytic. Contemporary theory of electro-oxidation and electroreduction without the deposition of metals. N. A. Izgarshayev. *Ibid.* 335-47.—Some aspects of the theory of electrooxidation and reduction are examd. The mechanism of oxidation is discussed for the formation of peroxysulfuric acid and the oxidation of aniline. The mechanism of reduction is discussed for PhNO_2 , oxalic acid, and MeNO_2 . State of the surface of an electrode upon anodic reactions by the method of alternating currents. T. I. Borisova. *Ibid.* 383-95; cf. C.A. 48, 1174i.—The differential capacity and the resistance of the surface of Ni in N NaOH were detd. Measurements were made at potentials -0.3 to $+1.8$ v. (against N H electrode). Capacity max. occurred at $+0.15$ (desorption of H and formation of NiO) and $+1.0$ v. (formation of NiO_2). The capacity was a min. at $+0.6$ v. where the resistance was a max. Electrode potentials and the crystal structure of metals. G. S. Vordivishenskii (S. M. Kirov Chem.-Technol. Inst., Kazan). *Ibid.* 410-13.—The anisotropy of metal crystals

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requires a variation of equil. electrode potential, with the crystal face. An equation is derived to express this dependence on orientation. The equation demonstrates the dependence of potential on crystal face, but exptl. verification is not possible at present. Electrode processes in the electrolytic polishing of metals. K. P. Hatashev (M. I. Kalinin Polytech. Inst., Leningrad). *Ibid.* 414-20. The electrolytic equalization of the surface of a metal anode (electropolishing) occurs at a definite electrode potential, characteristic for each metal in a given soln. The magnitude of the anode potential, corresponding to optimum polishing of microirregularities on the anode surface, is practically independent of the concn. and temp. of the polishing soln. A characteristic dependence is observed between the anode potential and c.d. of electropolishing in the form of plateaus corresponding to limiting currents. Steps in the polarization curves were observed for Cu in H_2PO_4 (sp. gr. 1.65), Ni in H_2SO_4 (sp. gr. 1.6), and carbon steel and Al in a soln. contg. 82 wt. % H_2PO_4 (sp. gr. 1.6), 12 wt. % H_2SO_4 (sp. gr. 1.84), and 6 wt. % CrO_3 . For optimum polishing the anode potential should be controlled at a value detd. from the polarization curve. The mechanism of electropolishing is considered to be the discharge of anions on projections of the anode surface. As a result of discharge of the anion, the preanode layer, which regulates the c.d. on different parts of the anode, is destroyed locally. Electrode processes in rapid copper cyanide electrolytes. P. S. Titov and N. D. Lukashina. *Ibid.* 442-5. The current efficiency of 8 plating baths, contg. 60-100 g./l. Na_2CO_3 with increasing concns. of CuCN and free cyanide equal to 0.08N, were investigated. The concns. of CuCN varied 0.25-1.50N. At a cathode

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c.d. of 10 amp./sq. dm. with a stirring rate of 600 r.p.m. the current efficiencies varied at 75° from 43.7% (0.25N) to 100.0% (1.35N), and at 35° from 19.0% (0.25N) to 99.2% (1.50N). The soln. contg. 1.35N CuCN showed an increase in efficiency with temp. from 45.2% (25°) to 100.0% (75°); the cathode c.d. was 10 amp./sq. dm. Stirring was found to increase the efficiency very slightly. Free cyanide was rapidly evolved if the Na₂CO₃ was absent. Anodic passivation could be diminished by the addition of KSCN. The application of polarization by alternating current to an investigation of the discharge of metal ions. B. V. Ershler and K. I. Rozental. *Ibid.* 440-60. --The active "resistance" of a Zn amalgam electrode in a soln. of Zn salt in the presence of a supporting electrolyte was measured on an a.c. bridge. The resistance consisted of 2 terms, one independent of frequency and the other inversely proportional to frequency. The 1st term resulted from chem. polarization and the 2nd from concn. polarization. From the resistance corresponding to chem. polarization the exchange current on the Zn amalgam electrode was detd. for different potentials and concns. of Zn ion in the soln. The rate of exchange was found to be proportional to the concn. of ions and to vary exponentially with the potential. It was concluded that the slow step in the exchange of Zn ions was the discharge of Zn⁺⁺ which occurred with the simultaneous transition of 2 electrons. The rate of exchange depended on the nature of the anions in soln. The latter in order of their accelerating influence on the

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exchanges were: $\text{SO}_4^{2-} < \text{Cl}^- < \text{NO}_3^-$. The processes of passivation in galvanic techniques. P. P. Sklyarov. *Ibid.* 455-63.---Degreasing and pickling conditions are discussed in regard to their effect on the quality of Sn plating and galvanizing. These procedures do not leave a clean metal surface but form a protective film of the passive type. This film must be sufficiently porous to pass current upon electrolysis. Dense, nonporous, thick films weaken the bond of the coating with the base metal. Optimum operating conditions are detd. by the type of article and the electrolyte. The most important films are those which are self-healing in corrosive media. Intermediate chem. treatment of the coating upon interrupting the electrolysis will displace the centers of crystal and facilitate the production of denser, fine-grained uniform deposits without significant change in the technological process. Cathodic polarization upon the deposition of copper from alcoholic solutions. B. P. Markov (Inst. Gen. and Inorg. Chem., Acad. Ukr. S.S.R., Kiev). *Ibid.* 481-72.---M. detd. cathodic polarization curves of CuCl in water, MeOH , EtOH , and iso-PrOH . Voltages were measured to within 0.5 mv. at a temp. of $30 \pm 0.05^\circ$. The curves were all similar but varied in the magnitude of the "initial" polariza-

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tion and in the limiting cathodic c.d. The initial polarization was relatively independent of c.d. and varied for CuCl solns. as follows: water, 32-33 mv.; MeOH, 58-63 mv.; EtOH, 67-70; iso-PrOH, 69-60 mv. A change in the magnitude of the limiting c.d. with a change of solvent was dependent to a 1st approximation on the viscosity of the medium. Crit. voltages were observed at which the current increased markedly upon the sudden application of voltage. These varied in the same way as the initial polarization and compared with the dielec. consts. as follows: water (81) 49 mv., MeOH (35.6) 77 mv., EtOH (20.8) 89 mv. A definite parallelism existed between these characteristic magnitudes and the structure of the deposit. M. proposed that the phys. properties of the electrolytic deposits depended predominantly on those conditions which detd. the moment of initial deposition of metal. Reasons for the formation of friable cathodic deposits of metals. V. P. Galushko and B. F. Zaytseva (State Univ., Dnepropetrovsk). *Ibid.* 482-7. The mechanism of the formation of powdery cathodic deposits is important to the field of powder metallurgy. It is proposed that cathodic H reduces metals such as Cu, Ag, and Pb away from the cathode surface, and qual. expts. are cited in support of this view. In addn., the adsorbed H layer prevents the incorporation of reduced atoms (or nuclei of crystals) into the cryst. lattice of the cathode. Such a secondary process proceeds very rapidly and forms a large no. of microcrystals which are not connected with each other or the cathode. An ultramicroscopic investigation of the formation of colloidal systems upon electrolysis and their role in the electrocrystallization of metals. M. N. Polukarov. *Ibid.*

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485-93. - P. sought to establish the presence of colloids at the cathode surface in cases where their formation has been suspected. A slit ultramicroscope was used with a small quartz chamber for electrolysis config. approx. 1 cu. mm. of soln. The electrodes were thin wires or strips of metal 6 mm. apart. These were either the metal being plated or Pt. The solns. studied were AgNO_3 , $\text{Pb(NO}_3)_2$, CuSO_4 , PtCl_2 , KAg(CN)_2 , the NH_3 complexes of Ag, Cu, and Ni, the pyridine complexes of these metals, and several other eq. solns. In addn., the solns. of AgNO_3 in MeOH , EtOH , and pyridine were studied. Colloidal particles were produced in all cases in the precathode layer and were drawn either to the anode, the cathode, or to both electrodes. General observations were made on the effect of expl. variables on these particles. Pyridine favored the formation of good deposits. The nature of potential and the electrochemical behavior of real oxide electrodes. P. D. Lukoytsev and S. A. Teuerlin. *Ibid.* 494-503. --- The potentials of electrodes of Ag_2O , HgO , NiO , and MnO_2 were measured in 4N KOH at 20° while anodically and cathodically polarizing at currents 2-10 ma. The electrodes were in the form of thin briquets pressed from a mixt. of graphite and oxide (2:3) and covered with a thin polyvinyl chloride layer to prevent crumbling. Potentials were measured while polarizing and for various periods up to 24 hrs. after discontinuing the current. In the discharge of NiO and MnO_2 , polarization was observed, attributed to the presence of a kinetic barrier in the electrochem. reduction. The concn. of active O in the solid oxide phase was also

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believed to change with electrochem. reduction or oxidation. These changes lead to nonequil. potentials in the NiO electrode when allowed to stand after polarizing. Analysis of these factors permitted a detn. of the overvoltage of O on NiO in good agreement with expt. The overvoltage of oxygen on the nickel oxide electrode. S. A. Gantman and P. D. Lukovtsev. (ibid. 604-12). Electrodes were prepd. of hillocks (wt. 0.2 g.) pressed from a mixt. of powders of Ni(OH)₂ and graphite (4:1) and placed in a jacket 7 X 7 X 2 mm. of a perforated band of Ni-Fe. This electrode was a small copy of the pos. electrode of the alk. storage battery. The dependence of the overvoltage of O on charging current was detd. for concns. of KOH from 0.22 to 4.31 N and for temps. from 20 to 50°. Comparison was made with O overvoltage on smooth Ni. For a completely charged NiO electrode, the overvoltage, η , could be expressed by: $\eta = a_1 + k_1/[OH^-]^{1-\alpha}$ for small currents, and $\eta = a + (RT/\alpha F) \ln i - (1 - \alpha/2)(RT/F) \ln [OH^-]$ for large currents. Here, a_1 and a were consts. for a given KOH soln., but increased with decreasing concn. of KOH. α was a const. equal to 0.65 and i was the current. These equations agreed with the hypothesis that the limiting stage in the electrodeposition of O was the discharge of hydroxyl ion on

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THEORY OF METAL OXIDE-GRAPHITE ELECTRODES

the surface of NiO and graphite. For an incompletely charged NiO electrode, the slope of the η vs. $\log i$ was less than for a completely charged electrode. This indicated a gradual change of the mechanism of O deposition with increase in charging and potential of the NiO electrode.

Theory of metal oxide-graphite electrodes. V. S. Daniel-lick. Ibid. 613-22.—A description of the properties of porous MnO₂ plus graphite electrodes (II) cannot be complete if the influence of the graphite as an electrochem. active component of the electrode is not taken into account. Electrodes such as II must be considered as polyelectrode systems and some properties of II are discussed on this basis. It is concluded that the general potential of II must be lowered by an increase of the specific surface of the graphite in the electrode, and that the general potential of II must be lowered by an increase in the specific resistance of the electrolyte penetrating the electrode. The distribution of currents in the system, MnO₂-graphite will depend on the dispersion, the specific surface, and the elec. cond. of the components.

Galvanic elements at temperatures of 1200-1600°. O. A. Bsh (Ural Branch Acad. Sci. Sverdlovsk). Ibid. 629-31.—The electrode potentials of Fe alloy and sulfide systems were measured in the temp. range 1200-1600° to det. the activities and free energies necessary for pyrometallurgical calcns. The 1st system was a concn. element consisting of 2 liquid Fe-carbon alloys (C 0.1, Si 0.015, Mn 0.07, Cr 0.065, and P 0.07%) as electrodes. One of these contained added C with the total content varying 0.2-4.7%. The other was the reference. The electrolyte was a fused synthetic slag contg. Al₂O₃ 49, CaO 43, and carbides of these metals about 8%. The activity of the C, therefore,

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detd. the e.m.f. of the cell. The system was contained in a large block of MgO with recesses for the liquid electrodes. Graphite rods were used for contact and inserted only at the moment of measurement. The e.m.f.'s in mv. at 1000° (% C in parentheses) were: 420 (0.2), 384 (0.25), 320 (0.30), 280 (0.50), 239 (1.03), 214 (1.49), 200 (1.81), 87 (2.09), and 0 (4.0). The calcd. activities of carbon varied from 0.003 (0.20) to 0.480 (4.0), and ΔF from -19,300 cal. (0.2) to -2750 cal. (4.0). The 2nd system consisted of 2 liquid alloys of Fe with C and Si and a slag consisting of CaO 50, MgO 10, and SiO₂ 40%. C was maintained at 0.01 in all the alloys (varying 3.04-4.48%). The reference electrode contained Si 43.0%. The other electrodes varied 0.05-43.0% Si. The e.m.f.'s in mv. at 1475° (% Si in parentheses) were: 195 (0.05), 103 (1.47), 157 (2.75), 136 (4.35), 141 (6.26), 114 (5.8), 98 (0.83), 80 (21.5), 66 (24.2), 60 (32.5), 37 (34.6), 0 (37.5), and 0 (43.0). ΔF varied from -17,900 cal. (0.05) to 0 (43.0). Four sulfide systems were studied: Pb-PbS, Cu-Cu₂S, Ni₃S₂-Cu₂S, and PbS-Cu₂S. In each system one of the electrodes was a liquid sulfide of const. compn. (PbS or Cu₂S) while the other was a melt with a varying concn. of S. The electrolyte (instead of a representative slag) consisted of a fused glass (SiO₂ 72, Na₂O 17, and CaO 9%) with special additions of Na₂S (about 10% of the wt. of the glass). The potential was detd. by the different concns. of S in the electrodes. The Pb-PbS system was studied at 1160°.

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Contact was made with Silit rods. Graphite rods were used in the other cases. The reference contained a mol. fraction of S, N_s , of 0.41. N_s in the other electrode varied from 0.017 to 0.33. The e.m.f.'s in mv. at 1180° (N_s in parentheses) were: 190 (0.017), 184 (0.010), 165 (0.025), 160 (0.029), 144 (0.037), 160 (0.005), 90 (0.030), 70 (0.100), 63 (0.147), 44 (0.170), 40 (0.23), 42 (0.30), 37 (0.37), and 22 (0.38). ΔF varied from -8230 cal. (0.017) to -1010 cal. (0.38). The Cu-CuS solns. were studied at 1200 and 1300°. The data were considered provisional. The reference electrode had $N_s \approx 0.33$. At 1200°, the e.m.f. varied 284-64 mv. for N_s varying 0.0022-0.310. At 1300°, the e.m.f. varied 306-44 mv. in the same concn. interval. ΔF (cal.) varied slightly (N_s in parentheses) from -13,160 (0.0022) to -3550 (0.268) at 1200° and -14,100 (0.0022) to -4520 (0.268) at 1300°. The system Ni_3S_2 -Cu₂S was studied at 1280°. The reference electrode was fused Cu₂S. The other electrodes contained Cu₂S with increasing amts. of Ni_3S_2 and Ni. The compns. studied (in mole %) with the e.m.f. in mv. were as follows: 6.0 Ni_3S_2 , 4.0 Ni, 70; 15.4 Ni_3S_2 , 1.6 Ni, 104; 27 Ni_3S_2 , 5.0 Ni, 148; 42 Ni_3S_2 , 5.0 Ni, 169; 56 Ni_3S_2 , 8.0 Ni, 175; 63 Ni_3S_2 , 6.3 Ni, 184; 78.5 Ni_3S_2 , 10.0 Ni, 188; and 88 Ni_3S_2 , 12.0 Ni, 197. ΔF varied from 0 (100% Cu₂S) to -9000 cal. (Cu₂S 0, Ni_3S_2 88, Ni 12.0%). Analogous results were obtained

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with the system $CuS-FeS$ at 1180° . The reference electrode was CuS . For increasing FeS in the electrode (mol. %) the e.m.f.'s in mv. were: 16 FeS , 57; 31 FeS , 88; 44 FeS , 108; 55 FeS , 110; 64 FeS , 137; 73 FeS , 145; 80 FeS , 154; 88 FeS , 168; 94 FeS , 169; and 100 FeS , 174. ΔF varied from 0 to -8020 cal. for 0 to 100% FeS . These data were in good agreement with data obtained by nonelectrochem. methods. The work of Russian investigators in the field of chemical sources of current in the second half of the 19th century. *N. A. Pakh, Ibid.* 532-8.—Historical. 23 references. An investigation of the corrosion of lead in oxidizing media. II. The influence of the addition of cobalt salt, temperature, and other factors on the term of service of the positive electrode of the lead storage battery. E. V. Krivolapova and B. N. Kabanov. *Ibid.* 539-48; *cf. C.A.* 36, 2213.—An accelerated method, consisting of anodic oxidation of smooth lead, was employed for lab. evaluation. The electrolyte was 0.7N H_2SO_4 . Oxidation products on the surface were detd. by means of a cathodic polarization curve on the same electrode. Corrosion changed the no. of coulombs necessary to reduce the products of anodic oxidation. The corrosion of Pb and Pb contg. 3, 8, 10, and 15% Sb was found to increase with temp. For Pb, the corrosion (considered 100% at 25°) was 58% at 0° and 178% at 65° . With increasing Sb, the anodic corrosion increased sharply at low c.d., but at high c.d. the effect of Sb was less pronounced.

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USSR/Chemistry, Physical - Electroplating Jun 50
Dissertations

"Conditions and Mechanism of Formation of Bright
Metallic Deposits"

"Vest Ak Nauk SSSR" No 6, pp 124-126

Briefly outlines contents of dissertation defended
by N. T. Kudryavtsev at Inst of Phys Chem, Acad
Sci USSR, for degree of Dr of Chem Sci: "Investi-
gation Into Conditions and Mechanism of Formation
of Spongy and Compact Bright Metallic Deposits on
a Cathode." Dissertation gives analysis of

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contemporary scientific developments in the theory
of electroplating process and reviews numerous
works of Soviet scientists. Kudryavtsev used his
considerable experience for solving 2 essential
problems of electroplating: obtaining compact
bright coatings and deposition of metallic powders.
Most of theoretical studies used for developing
practical technological processes such as: method
for obtaining light, but not bright, compact de-
posits of zinc from alk zincate electrolytes with
addn of Sn, Pb and Hg instead of cyanide elec-
trolytes, bright nickel plating from electrolyte,
contg salts of naphthalene disulfonic acid, which
gives less porous and more uniform coatings, etc.

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Electrolytic production of highly disperse lead powder
 N. I. Kudryavtsev and E. A. Tereshkovich (D. I. Mendeleev Chem.-Technol. Inst., Moscow). *Zhur. Priklad. Khim.* (J. Applied Chem.) **23**, 607-12 (1950).—Pb sponge was deposited in an electrolyte (I) Pb (as $Pb(OH)_2$) 0.27 N, NaOH (total) 2.51 N, and Na_2CO_3 0.55 N; and (II) 0.10, 1.24, and 0.26, with Pb anodes and Fe-rod cathodes. Spongy Pb is formed for longer times, at higher c.d.s. Thus, in I, at 18-20°, it formed for 5 and 40 min., resp., with an initial 1 and 30 amp./sq. dm.; in II, for 30 and 60 min.; with an initial 2 and 5-15 amp./sq. dm. Consequently, sponge formation is more prolonged in the more dil. electrolyte. The latter shows also an effect of the temp.; thus, in II, at a c.d. of 10 amp./sq. dm., Pb sponge formed for 60 and 30 min., resp., at 18-20° and at 50°. In order to obtain Pb-sponge deposited for 40-60 min., at room temp., the c.d. should be kept preferably, in I, at 30-40; in II, at 5-10 amp./sq. dm. The current efficiency is nearly theoretical. Hydrogen evolution is noticeable during the 1st 2-5 min. only, and only at the highest c.d. in I. The Pb anodes tend to

become passive rapidly. By potential detns., passivation occurs, in both electrolytes, at anodic c.d. above 0.50-0.75 amp./sq. dm. Higher temp. raises this upper limit very slightly only and the concn. of Pb in the electrolyte has no effect. Increase of the concn. of NaOH was equally ineffective. Excess of Na_2CO_3 above 0.5 N lowers the permissible upper limit of anodic c.d.; in I, with Na_2CO_3 0.5 N, that limit is 0.75; with Na_2CO_3 1.1 N, it is 0.3 amp./sq. dm.; in II, with Na_2CO_3 0.25 N, the limit is 0.8 N, with 0.7 N, 0.5 amp./sq. dm. This passivating effect of Na_2CO_3 can be counteracted by a depassivating effect of addn. of glycerol, not less than 10-15 cc./l. depending on the amt. of Na_2CO_3 . With 15-20 cc./l. of glycerol, the upper limit of the permissible anodic c.d. is raised, with Na_2CO_3 ~ 0.5 N, to 1 amp./sq. dm., and with Na_2CO_3 ~ 1.5 N, to 0.75 amp./sq. dm. The glycerol has no effect on the Pb sponge formed at the cathode. N. T.

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USSR/Metals - Cathode
Zinc

1 May 50

"Causes of Formation of Zinc Spongy Deposits on
a Cathode," N. T. Kudryavtsev, Inst of Phys Chem,
Acad Sci USSR

"Dok Ak Nauk SSSR" Vol LXXII, No 1, pp 93-96

Describes experiments with zincate electrolytes.
Concludes formation of zinc sponge on cathode
is caused by colloidal zinc particles or by par-
ticles of partially oxidized zinc. These particles
being transferred on cathode in form of metallic
sols give rise to disorderly crystal growth of
deposited metal. Explains mechanism of action of
such admixtures as lead, tin, and mercury.

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*Mechanism of Formation of Bright Zinc Deposits on the Cathode. N. T. Kudryavtsev and G. V. Ershler (*Doklady Akad. Nauk S.S.S.R.*, 1950, 78, (3), 363-364; *C. Abstr.*, 1950, 44, 7676).—[In Russian]. Bright Zn electrodeposits of any desired thickness are produced from acid $ZnSO_4 + Al_2(SO_4)_3$ baths in the presence of 2:6- or 2:7-naphthalenedisulphonic acid at room temp. and at high c.d. (3-10 amp./dm.²), with the bath agitated by compressed air. These deposits are oriented along the hexagonal axis, in contrast to the random dull deposits produced in the same bath without the organic addn. At a higher temp., a higher c.d. is necessary to give the bright deposit. The effect of the brightener is due to adsorption on growing crystal faces.

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Anode process in zinc salt solutions, and the constancy of the electrolyte in alk. Zn solns. were investigated. Small amts. of Pb (up to 0.6%) and Sn (up to 0.2%) did not markedly affect either the anode polarization, the magnitude of the limiting current, or the current efficiency. The anodic c.d., at which the anodic current efficiency was approx. equal to the cathodic current of concn. 0.0099%, was within the limits of 1.5-2.0 amp./sq. dm. At and above 3.0 amp./sq. dm., owing to a polarization of the anode surface, the anodic current efficiency was sharply reduced. By use of anodes alloyed with Sn, or Pb plus Sn, the required small concn. of Sn in soln., to insure compact cathodic deposition, could be maintained. Neither addn. of glycerol, Rochelle salt, starch, gelatin, or other similar org. substances nor the super-position of a.c. on d.c. exerted any marked effect on the behavior of the Zn anodes.

George L. Jones, Jr.

KUDRYAVTSEV, N.T.

Causes of plating defects in chromium plating. N. T. Kudryavtsev and L. A. Shmel'ko. *Appl. Chem. U.S.S.R.* 25, 1330-42 (1952) (Eng. translation); *Zhur. Priklad. Khim.* 25, 1283-8 (1952). The formation was studied of sickle-like or deep circular holes and of cone-like outgrowths on the surface of electrolytic Cr plates. Cr plates were made from solns. contg. 240-60 g./l. CrO_3 and 6-8 g./l. Cr^{3+} . The distance between anode and cathode was 25-30 mm., and the anodes were of Pb contg. 5-7% Sb. The cathodic c.ds. were 38-40 and 50 amp./sq. dm., resp., and the corresponding bath temps. 50 and 60°. Formation of holes and outgrowths could not be attributed to the direct action of mech. and chem. impurities in the bath. Neither addn. to the plating soln. of fine anode sludge, Fe, or Al powder or dry ground pigments, nor an accumulation of Cr^{3+} and Fe compds. in the soln., created Cr plates with irregularities. However, such irregularities could be observed when the ratio of $\text{CrO}_3:\text{SO}_4$ was high. In this case basic chromic oxides may have accumulated on the solid-liquid interface on the cathode during discharge of hexivalent Cr. Low H-ion concn. on the cathode favored the formation of positively charged colloidal particles of chromous hydroxide which deposited on the surface of the cathode and which inhibited the growth of crystals of metallic Cr at these spots, resulting in pits and holes. Protrusions may have formed when the deposited particles of chromous hydroxide were reduced to metallic grains. W. Beck

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RODOLAVICH, N. I.

Electrolytes

Causes of zinc sponge formation on the cathode and action of additions to zincate electrolytes. Zhur, fiz.khim. 26, No. 2, 1952.

9. Monthly List of Russian Accessions, Library of Congress, September 1952, Unclassified.

KUDRYAVTSEV, N. T.

PHASE I
BOOK

TREASURE ISLAND BIBLIOGRAPHICAL REPORT

AID 587 - I

Call No.: AF 639674

Authors: LAYNER, V. I. and KUDRYAVTSEV, N. T.

Full Title: FUNDAMENTALS OF ELECTROPLATING. Part 1, 3rd. ed. rev.

Transliterated Title: Osnovy gal'vanostegii. Chast' 1. 3-e izd., perer. i dopol.

PUBLISHING DATA

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Publishing House: State Scientific and Technical Publishing House of Literature on
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Appraiser: Titov, P. S., Prof., Dr.

PURPOSE: The book is intended for engineers and technicians in scientific research institutions, enterprises and design organizations dealing with problems of corrosion and electroplating, and can be useful to students specializing in this field.

TEXT DATA

Coverage: This work deals with the general principles and the technology of electroplating processes, as well as with the processes of the preparation of metal surfaces for the application of metal layers. It gives the characteristics of metal coatings and discusses the quality of electrolytic platings as it depends on the surface conditions and on the plating materials. The book describes the surface treatment, the electrolytic polishing of metals, the structure of the deposited metals and the metal distribution in a cathode surface. Zinc, cadmium, copper, brass, nickel,

Osnovy gal'vanostegii. Chast' 1. 3-e izd., perer. i dopol.

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chromium, tin and lead plating processes are examined in detail, with attention to the qualities, corrosion-resisting properties and the practical application of different coatings. This work is the third supplemented edition. Some chapters are radically changed and new chapters are added. The book is provided with illustrations, microphotographs of surfaces, tables and diagrams.

No. of References: Total 167, Russian 160, 1909-1952

Facilities: B. S. Yakobi, E. K. Lents, P. P. Fedot'yev, V. A. Kistyakovskiy, N. A. Izgaryshev

REPRODUCED, NTC

Conditions and Reasons for the Decomposition of Metals Zinc
on the Cathode in Spongy Form. N. I. Zhuravskaya, L. I. Zhuravskaya,
and L. I. Zhuravskaya. *Electrochim. Acta*, 1977, 22, 1077.

... (ii) a dense sponge over the whole surface, formed
at ϵd , near to the limiting value, and (iii) local spongy deposits
formed at ϵd less than the limiting value, and (iv) spongy deposits
formed after the start of electrolysis.

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Mar. 25, 1954
Electrochemistry

24

Electrodeposition of alloys of cadmium with zinc. N. T. Kudryavtsey and B. P. Pereturina. *Zhur. Priklad. Khim.* 26, 165-67 (1953). — Zn and Cd alloys were deposited from aq. baths contg. KCN. Two plating baths were used with Cd(OH)₂ and KCN, resp.: 0.6, 1.5N in one bath (I), and 1.0, 3.0N in the other bath (II). Before adding KCN, an equiv. vol. of soda. was withdrawn to maintain the metal cation. const. Simultaneously KCN was added to make up for the loss. As anode, a 50 Zn-50 Cd plate was used. For a c.d. of 1 amp./sq. dm. at 15-20° the best electrolyte concns. in equivs. of Cd, Zn, KCN, and KOH (total) were: I 0.45-48, 0.17-0.20, 1.5, and 0.6, II 0.62-0.91, 0.23-0.22, 3.0, and 1.0. The best deposits were Cd and Zn in wt. %: I 84-80 and 20-14; II 77-82 and 21-18. A higher concn. of KOH increased the proportion of Zn in the deposit, while a higher c.d. decreased it. Zn would not be deposited with Cd at a Zn concn. in the electrolyte lower than 0.1N. Deposits from I with free KCN at 0.5N were lighter than from II with free KCN of 1.0N and polished readily; those from II polished with more difficulty. Deposits of 5, 10, and 15 μ were obtained from I, at c.d. of 1 amp./sq. dm. The deposits were of the same compn., 85% Cd and 14% Zn, regardless of the thickness of the layer. Deposits with up to 80% Cd deposited on Fe were found to be most corrosion resistant. I. Benenowitz

KUDRYAVTSY, N.T.

Bright copper coatings of insoluble bases on deep printing cylinders. V. G. Solokhina, N.T. Kudryavtsev, and V. S. Lapashkina. *Poligraf. Proizvod.* 1954, No. 2, 72-80; *Referat. Zhur., Khim.* 1954, No. 48975. — Smooth, bright, and hard Cu deposits 100-200 μ thick were obtained from solns. contg. CuSO_4 250, H_2SO_4 60; thiourea 0.005, Na salt of 2,6- and 2,7-naphthalenedisulfonate 0.5 g./l. at 10-25° and 10 amp./sq. dm. c.d. The quality, hardness, internal strains, and microstructure of the Cu deposit in relation to c.d., stirring, and other factors were studied. A procedure for adjusting the soln. for the thiourea content is described. M. Hozel

(2)

The electrodeposition and protective value of zinc-cadmium alloys. N. T. Kudryavtsev and E. F. Peretulin. *Electroplating and Metal Finishing* 4: 872-5 (1954). Joseph S. Smatko

KUDRYAVTSEV, N. T.

USSR/Scientists

Card 1/1 : Pub. 147 - 1/22

Authors : Kudryavtsev, N. T., and Gorbachev, S. V.

Title : About the scientific activities of N. A. Izgaryshev

Periodical : Zhur. fiz. khim. 28/11, 1874-1877, November 1954

Abstract : An eulogy is presented honoring the 70th birthday and 43rd year of active pedagogical work of Professor of Physical Chemistry, academician, recipient of Stalin premium, Nikolay Alekseevich Izgaryshev.

Institution :

Submitted :

KHDRVAVTSEV

KUDRYUTSEV, N. T.

USSR/Chemistry - Electrolysis

Card 1/2

Pub. 147 - 20/26

Authors : Tsareva, Yu. S.; Solokhina, V. G.; Kudryvtsev, N. T.; and Vagramyan, A. T.

Title : Effect of surface active substances on the mechanical properties of electrolytic Cu-depositions

Periodical : Zhur. fiz. khim. 29/1, 166-173, Jan 1955

Abstract : It was established experimentally that surface active substances added some times to an acid copper sulfate solution for copper plating produce different effects on the mechanical properties of the deposit. It was found that surface active substances can cause internal contraction and expansion stresses depending upon the nature and concentration of the substance and the current density.

Institution : Academy of Sciences USSR, Institute of Physical Chemistry, Moscow

Submitted : June 9. 1954

Periodical : Zhur. fiz. khim. 29/1, 116-173, Jan 1955

Card 2/2 Pub. 147 - 20/26

Abstract : It was established that copper deposits obtained from electrolytes containing thiourea and naphthalindisulfonic acid possess sufficient plasticity, high micro-hardness and small internal stresses. An instrument is described which records automatically any changes in internal stresses of electrolytic deposit in electrolysis processes. Nine USSR references (1935-1951). Table; graphs; drawing.

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California Division
of the President
of the United States
20.

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Electrodeposition of Zn

1. united and

KUDRYAVTSEV, N. T.

Distr: hE43/hE2c

Bright copper coatings. V. G. Solokhina, N. T. Kudryavtsev, and V. S. Laputukhin. U.S.S.R. 103,827, May 24, 1968. To the thiourea conc. acid electrolyte used for Cu plating is added 2 g./l. naphthalenedisulfonic acid to reduce the internal strains and the brittleness of the deposit. Cf. C.A. 50, 4677f. M. Hosh.

1/1

5
2

Antipov, K.P.
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(Continued on next card)

ANTIPOV, K.F. --- (continued) Card 2.
GRANOVSKIY, G.I.

GRANOVSKIY, G.I., redaktor; DANILOV, P., redaktor; UGOL, V.I., redaktor; CHARNKO, D.V., redaktor; GOROD, A.G., redaktor; [deceased]; SOKOLOVA, T.F., redaktor

[Machine builder's manual] Spravochnik stroitel'stva mashinostroyeniya
v dvukh tomakh, red.sovet V.M. Gusev. Chelovek, 1958. 400 s. 30 kopek.
1 dr. Moskva, Gos.nauchno-tekhn.izd-vo mashinostroyeniya, 1958.
Vol. 1. (Pod red. A.G. Kosilova) 1958. 484 p.
Malaya) 1958. 584 p.
(Machinery industry)

Kudryavtsev, P. T.

18
Electrolytic Deposition of Cu . N. T. Kudryavtsev and
L. A. Yakovleva. *Trudy Ilosko. Khim. Tekhn.*
in B. I. Mendeleev 1956 No. 22
noncorrosive electrolyte was found
4 H_2O 280-430 g/l. (2-3N) and 1-2 g/l. CuSO_4
pH 2.5. At 20-40°C the optimum c.d. at the
anode was 8-8 amp./100 sq. cm. without stirring of the
electrolyte and 4-12 amp./100 sq. cm. with stirring. At
70°C the d. of the current may be raised to 15-18 amp./100
sq. cm. without stirring. In all instances this electrolyte
gave hard deposits ≥ 0.5 mm. thick.
A. P. Kotlov

KUDRYAVTSEV, N.T.

USSR/Physical Chemistry - Electrochemistry.

B-12

Abs Jour : Referat Zhur - Khimiya, No 6, 25 March 1957, 18704

Author : Kudryavtsev, N.T., Bek R.Yu., and Kushevich, I.F.
Inst : Zh. fiz. khimii, 1952, 26, No 2.

Title : Reasons of Formation of Zinc Sponge Upon Cathodes of
Zinc-Containing Electrolytes at Currents of Low Densities

Orig Pub : Tr. Mosk khim-tekhnol. in-ta, 1956, vyp. 22, 137-142

Abstract : The mechanism of Zn-sponge formation on a cathode, at low densities of current, in zinc-containing electrolytes and, in particular, the part played by anodes and ions of nobler metals and oxidizing agents, is investigated. It is shown that when electrolysis is carried on with insoluble anodes (Pt and Ni) the sponge is formed only at the upper part of cathode near the boundary of the electrolyte with air, and that when electrolysis is carried on with Zn-anode the sponge is formed over the whole surface. When the anode and cathode spaces are

Card 1/2

- 310 -

Khimiya, No 6, 25 March

B-12

KUDRYAVTSEV, N.T.

Electroplating of lead from alkaline solutions. N. T. Kudryavtsev, V. G. Zolotareva, and Yu. V. Malygin. *Zhur. Priklad. Khim.*, 29, 236-41 (1956); *cf. C.A.B.*, 44, 2925d.
The effect of salts of Sn, Hg, Cu, Al, and Sb, and of K_2CrO_4 , $KMnO_4$, $KClO_4$, H_2O_2 , and glycerol on the quality of the Pb deposit from an alk. electrolyte was studied. In a rectangular glass cell. Glycerol was most effective: the soly. of Pb in 4N KOH increased from 23.8 g./l. without glycerol to 77.5, 104.1, and 115.1 g./l. in the presence of 30, 50, and 130 ml./l. glycerol; the e.d. interval giving dense deposits without dendrites increased, especially at high temps. and when the electrolyte was stirred (with air); the accumulation of carbonate up to 2N did not affect the results. For best results the following conditions were recommended: an electrolyte contg. 0.8-1.0N Pb (as plumbite or glycerite), 2.5-4.5N NaOH (or KOH), 50-65 ml./l. glycerol; temp. 20-60°; without stirring, a e.d. of 0.5-1.0 and 0.5-1.5 amp./sq. dm. at 18-23° and 60°, resp.; with stirring the e.d. increased to 3-5 amp./sq. dm. The current efficiency approached 100% and the polarization was slight. Good adhesion to Fe was obtained by a preliminary coating of Cu or Cr (0.2-0.5 μ).
I. Benecowitz

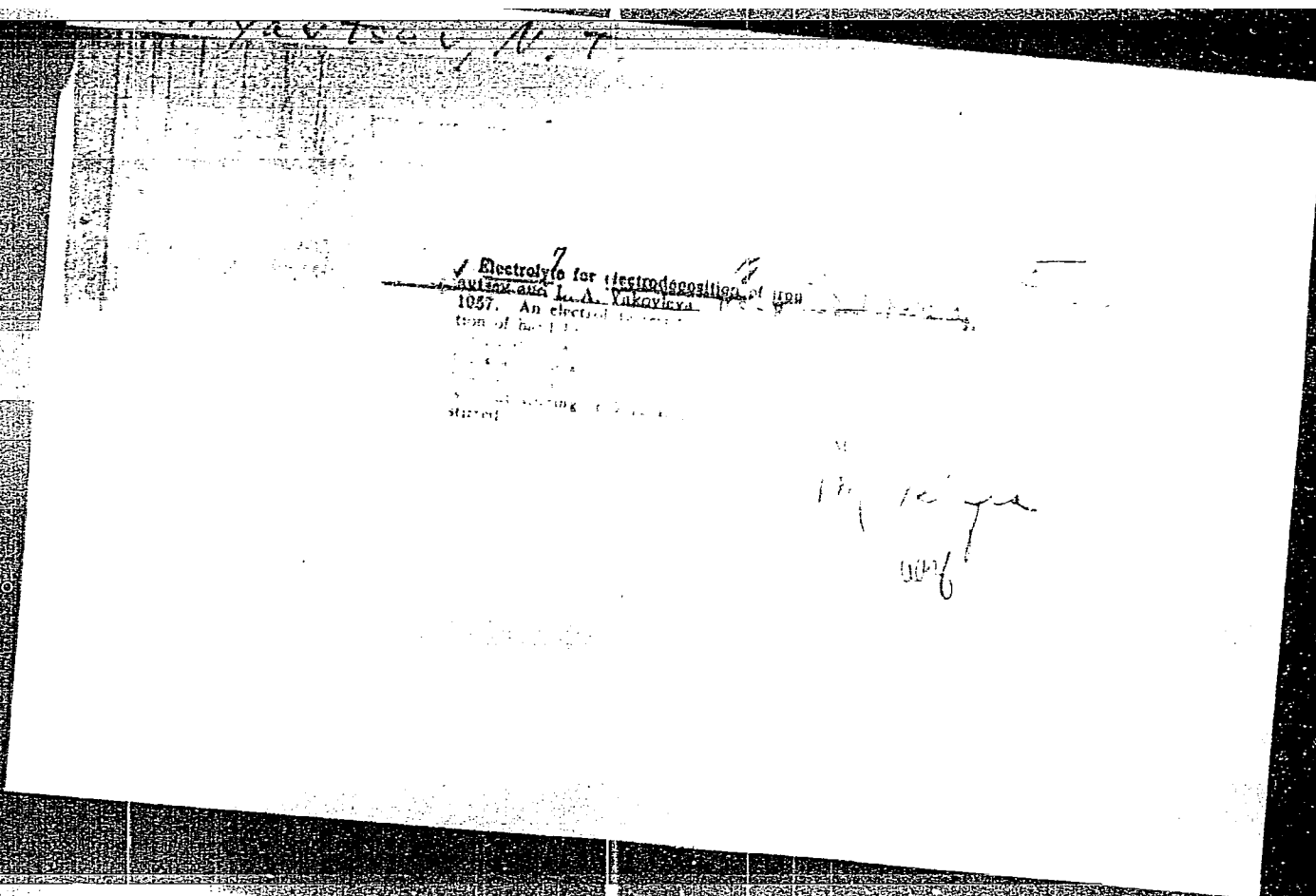
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ATANASYANTS, A.G.; KARATAYEV, V.M.; KUDRYAVTSEV, N.T., doktor khimicheskikh nauk.

Electropolishing of magnetic soft-alloy tapes using alternating current. Vest. mash. 36 no.8:67-68 '56. (MLRA 9:10)

(Polishing, Electrolytic)



KUDRYAVTSEV, N. T.

VAGRAMYAN, A.T., professor, otvetstvennyy redaktor; KUDRYAVTSEV, N.T., professor,
otvetstvennyy redaktor; SHLUGER, M.A., kandidat tekhnicheskikh nauk,
otvetstvennyy redaktor; YKOROV, N.G., redaktor izdatel'stva;
PAVLOVSKIY, A.A., tekhnicheskii redaktor

[Theory and practice of electrolytic chromium plating] Teoriia i
praktika elektroliticheskogo khromirovaniia. Moskva, 1957. 231 p.
(MLRA 10:9)

1. Akademiya nauk SSSR. Institut fizicheskoy khimii
(Chromium plating)

KUDRYAVTSEV N.T.

Layner, Vladimir I., Professor, Doctor; Kudryavtsev, Nikolay T.,¹⁸⁴
Professor, Doctor.

Osnovy gal'vanostegii (Principles of Electroplating) Chast' II
(Part II) Moscow, Gosudarstvennoye nauchno-tekhnicheskoye
izdatel'stvo literatury po chernoy i tsvetnoy metallurgii, 1957,
3d edition, rev. and enl., 647 pp., 10,000 copies.

Ed.: Chernov, A. N.; Ed. of the Publ. House: Kamayeva, O. M.,
Tech., Ed.: Attopovich, M. K.; Reviewers:
Gorbunova, K. M., Professor, Doctor; Dokin, N. I.,
Engineer, and Semin, V. M., Engineer.

PURPOSE: The book is intended for engineers and technically trained
personnel in electroplating shops, scientific research
institutions, and engineering design organizations, and may
be of use to university students.

Card 1/16

Principles of Electroplating (Cont.)

184

COVERAGE: The book treats of electroplating with noble and rare metals and alloys. Equipment, theoretical principles and techniques of electroplating are described in detail. Personalities mentioned include: Shvyryayev, G. K., Engineer, and Korolenko, N. K., Engineer. There are 202 references, 96 of which are USSR, 78 English and 28 German.

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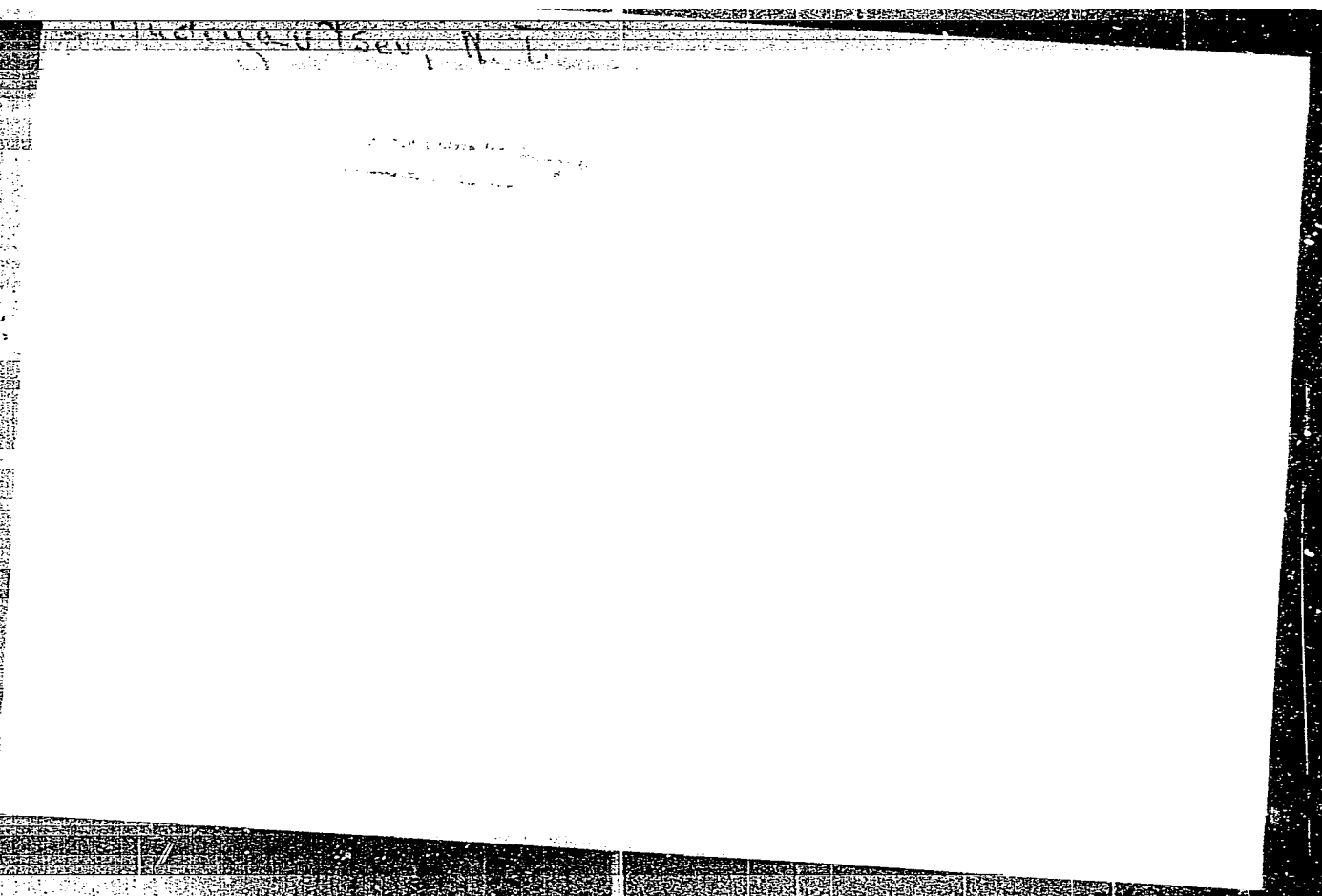
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May 28, 1958

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KUDRYAVTSEV, N. T.

AUTHORS: Moroz, I. I., Engineer and Kudryavtsev, N. T., Doctor of Chemical Sciences. 129 - 8 - 8/16

TITLE: Zinc plating in a cyanide electrolyte and the mechanical properties of steels. (Tsinkovaniye v tsianistom elektrolite i mekhanicheskiye svoystva staley).

PERIODICAL: "Metallovedeniye i Obrabotka Metallov" (Metallurgy and Metal Treatment), 1957, No.8, pp.28-33 (U.S.S.R.)

ABSTRACT: The authors of this paper studied the change in the physical and mechanical properties of steels as a function of their composition and the conditions of the chemical and electro-chemical treatment during cyaniding. The studies were made on specimens of the steels: 30X1CA, 38XA, 12X2H4A, 30X2H2BA, Y9 and on commercial iron. The chemical compositions of all these are given in Table 1, p.29. The electrolyte temperature was maintained at 18-20 C. The authors studied the influence of the chemical and electro-chemical preparation and the influence of the cyaniding regimes (heat treatment, duration of the cyaniding and current density). The influence of the duration of cyaniding on the mechanical properties of the steel 30X1CA are entered in Tables 3 and 4 for plating durations of 0 to 90 minutes, whilst values on the influence of the current density on the mechanical properties are entered in

Card 1/2

Zinc plating in a cyanide electrolyte and the mechanical properties of steels. (Cont.) 129 - 8 - 8/16

Tables 6 and 7. Zinc plating in a cyanide electrolyte affects the mechanical properties of high strength steels (e.g. of the steel 30XrCA hardened from 880 C and tempered to 200 C) to a larger extent than it does of tougher steels. This phenomenon is attributed to the greater ability of high strength steels to absorb hydrogen which is separated during electrolysis. The mechanical properties of the steel 30XrCA change during zinc plating in a cyanide electrolyte if after hardening the material is subjected to a low temperature tempering at 200 C; thereby the relative elongation decreases and also the ultimate strength and the relative compression. With increasing duration of the zinc plating and increasing current density a decrease is observed in the mechanical properties. Heating of zinc plated specimens of the steel 30XrCA, which have been subjected to low temperature tempering, re-establishes only partly its mechanical properties; the elasticity is fully re-established (number of bendings until failure). Preparatory operations have no influence on the mechanical properties of the steels. There are 7 tables and 2 figures.

AVAILABLE:

Card 2/2

KUDRYAVTSEV, N.T.

SOV/137-58-8-17452

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 8, p 179 (USSR)

AUTHORS: Doktorina, S.V., Kudryavtsev, N.T.

TITLE: The Cathode Polarization of Solutions of Nickel Sulphate with High Acidity (Katodnaya polyarizatsiya rastvorov sernokislogo nikelya s povyshennoy kislotnost'yu)

PERIODICAL: Tr. Gor'kovsk. politekhn. in-ta, 1957, Vol 13, Nr 5, pp 66-70

ABSTRACT: The effect of the concentration of Ni, the pH, and the temperature on the cathode potential E in the electrolytic deposition of Ni from one-component sulfate solutions permitting the utilization of high current densities was studied. It was established that an increase in the concentration of Ni and the temperature decrease the E. In the 5-100 amp/dm² range of cd the cathode polarization of Ni in one-component sulfate solutions has the same character of relationship as in multi-component solutions. Upon a decrease in pH the E becomes less negative, this effect becomes less noticeable upon an increase of the concentration of Ni in the solution (from 200 to 400 g/liter). Dense, interlacing, fine-crystalline deposits of Ni are obtained with a lowered

Card 1/2

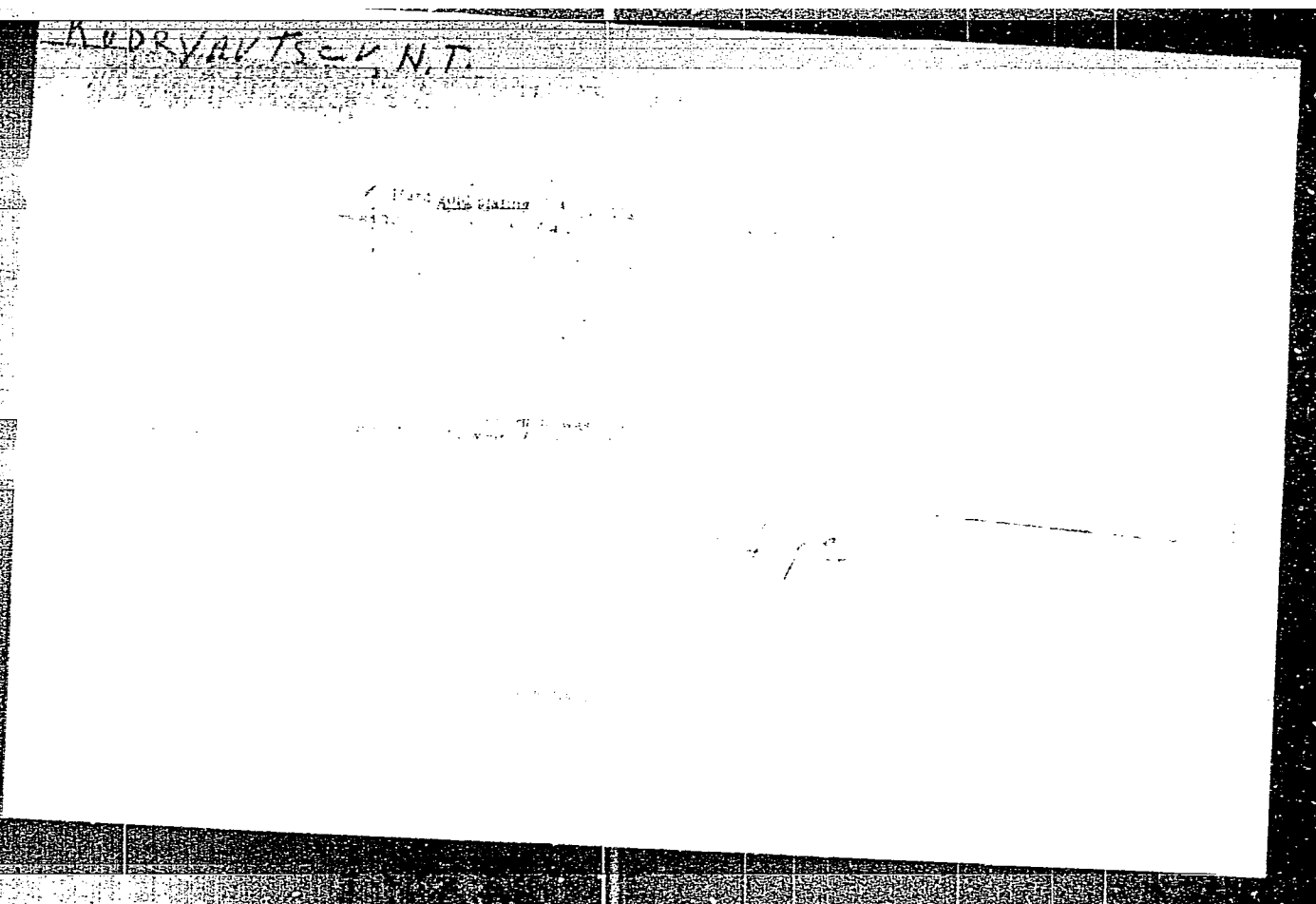
SOV/137-58-8-17452

The Cathode Polarization of Solutions of Nickel Sulphate with High Acidity
concentration of Ni - 250 g/liter at 60°C, a pH of 2 and a cathode cd even
greater than 100 amp/dm².

Z.S.

1. Nickel sulphate solutions--Electrolysis
2. Nickel--Electrodeposition
3. Electrolytes--Properties

Card 2/2



Causes of local sponge formation on cathodes in zinc electrolytes. N. T. Kudryavtsev, R. S. Kuznetsov, and I. A. 47, 1984. — The causes of local sponge formation on cathodes were detd. in an electrolyte contg. from 0.2 to 0.4% Zn in 2.5N NaOH at 20° with a p.d. of about 0.2 V/cm² sq. cm. Spongy Zn deposits (on Cu) formed with sol. (Zn) and insol. Pt and Sn anodes. With the former the spongy deposit formed over the entire area of the electrode, whereas with insol. anodes it formed primarily at the apex of the anode and only a few specks appeared below the surface. These were due to some spongy material forming at the boundary was shown by expts. with cathodes bent at 90° angles so that one leg, shorter than the other, was under the surface of the electrolyte; no spongy deposit formed on the shorter leg. The addn. of Sn, Pb, Hg, Bi, As, and Sb (0.005–0.01 g./l.) to zincate electrolytes prevented sponge formation. On the other hand, H₂O₂, KNO₃, and other oxidizing substances, when present in high concns., caused sponge formation with sol. and insol. anodes. Benzadate

KUDRYAVTSEV, N. T.

AUTHORS Tyutina, K. M., and Kudryavtsev, N. T. 20-3-44/59

TITLE Note on the Electrolytic Deposition of a Tin-Nickel Alloy from Chloride-Fluoride Solutions (Elektroliticheskoye osazhdeniye splava olovo-nikel' iz khlorid-ftoridnykh rastvorov).

PERIODICAL Doklady Akademii Nauk, 1957, Vol. 115, Nr 3, pp. 580-582 (USSR).

ABSTRACT This method of deposition on the basis of tin are of considerable interest to electroplating. Coatings with such alloys are distinguished by a number of valuable properties, some of which are utilized in industry with good results as protective and protective and decorative coatings on steel products. This new method, mentioned in the title, where the alloy contains up to 65% of tin, possesses a practical as well as a theoretical importance. Apart from its resistance to diluted mineral acids, the coating emerges from the trough with a glossy surface and a nice pink shade, making any polishing unnecessary. The coating consists of 35% Ni and 65% Sn and forms an intermetallic compound, which can only be produced by electrolysis. The composition of the electrolyte and the electrolysis conditions are given:

2,1 - 2,5 N NiCl_2 + 0,4 - 0,5 N SnCl_2 + 7 N NaF + 1,0 N NH_4F ;

Card 1/3 pH = 4,0 - 4,5. Temperature of the electrolyte 45 - 55°C. Current

Note on the Electrolytic Deposition of a Tin-Nickel Alloy from Chloride-Fluoride Solutions.

20-3-44/59

density 0,5 - 4,0 A/dm². The production efficiency with respect to current amounts to 96 - 98%. Anode surface relation. $S_{Sn} : S_{Ni} = 1 : 20$. The average anodic current density 0,5 - 1,0 A/dm² over the total surface of the anodes. By the addition of fluorine salts of sodium and of ammonium to the chlorous electrolyte the cathodic potentials of the tin separation reach more negative values than those of nickel in the identical solution. This apparently takes place because of the formation of solid complex ions SnF_4 and $SnCl_2F_2$,

which need a higher activation energy for discharge. The presence of fluoride effects an approach of the potentials of tin and nickel, which enables them to be deposited simultaneously at the cathode. This is proved by the so-called decomposition curves (fig. 1). A considerable depolarization takes place which, apparently is dependent upon a diminution of the free energy at the formation of the chemical compound, that is the Sn-Ni- alloy. The investigations of the authors have shown, that the composition of the alloy is little dependent on the Sn- and Ni- concentration in the electrolyte and on the character of the cation of the fluorine acid, which, however, is of great importance in the modification of the physico-chemical properties of the deposits. The range of current density, where glossy deposits are

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20-3-44/59

Note on the Electrolytic Deposition of a Tin - Nickel Alloy
from Chloride - Fluoride Solutions.

produced, depends on the temperature and on the pH-value of the electrolyte. The interval of permissible current densities shrinks with the increase of both. Operating codes were worked out for a diminished Sn- content and for a.c.coatings and for current reversal. The two latter factors had almost no influence on the composition of the deposit, they impaired, however, its quality to a considerable extent. There are 2 Slavic references and 1 figure.

ASSOCIATION: Moscow Chemical-Technological Institute imeni D. I. Mendeleyev
(Moskovskiy khimiko-tekhnologicheskii institut im. D. I. Mendeleyeva)

PRESENTED: By A. N. Frumkin, Academician, January 23, 1957.

SUBMITTED: November 20, 1956.

AVAILABLE: Library of Congress.

Card 3/3

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1958 -

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CIA-RDP86-00513R000827220001-9"

ANTIPOV, K.F., inzh.; BALAKSHIN, B.S., prof., doktor tekhn.nauk; BARYLOV, G.I., inzh.; BEYZEL'MAN, R.D., inzh.; BERDICHEVSKIY, Ya.G., inzh.; BOBKOV, A.A., inzh.; KALININ, M.A., kand.tekhn.nauk; KOVAN, V.M., prof., doktor tekhn.nauk; KORSAKOV, V.S., doktor tekhn.nauk; KOSILOVA, A.G., kand.tekhn.nauk; KUDRYAVTSEV, N.T., prof., doktor khim.nauk; KURYSHEVA, Ye.S., inzh.; LAKHTIN, Yu.M., prof., doktor tekhn.nauk; NAYZMAN, M.S., inzh.; NOVIKOV, M.P., kand.tekhn.nauk; PARIYSKIY, M.S., inzh.; PEREPONOV, M.N., inzh.; POPILOV, L.Ye., inzh.; POPOV, V.A., kand.tekhn.nauk; SAVERIN, M.M., prof., doktor tekhn.nauk; SASOV, V.V., kand.tekhn.nauk; SATEL', E.A., prof., doktor tekhn.nauk; SOKOLOVSKIY, A.P., prof., doktor tekhn.nauk [deceased]; STANKOVICH, V.G., inzh.; FRUMIN, Yu.L., inzh.; KHRAMOY, M.I., inzh.; TSETTLIN, L.B., inzh.; SHUKHOV, Yu.V., kand.tekhn.nauk; MARKUS, M.Ye., inzh., red. [deceased]; GRANOVSKIY, G.I., red.; DEM'YANYUK, F.S., red.; ZUBOK, V.N., red.; MALOV, A.N., red.; NOVIKOV, M.P., red.; GHARNKO, D.V., red.; KARGANOV, V.G., inzh., red. graficheskikh rabot; SOKOLOVA, T.F., tekhn.red.

[Manual of a machinery designer and constructor; in two volumes]
Spravochnik tekhnologa-mashinostroitelia; v dvukh tomakh. Glav. red. V.M.Kovan. Chleny red.soveta B.S.Balakshin i dr. Moskva, Gos.nauchno-tekhn.izd-vo mashinostroit.lit-ry. Vol.1. Pod red. A.G.Kosilovoi. 1958. 660 p. (MIRA 13:1)
(Mechanical engineering--Handbooks, manuals, etc.)

SOV/137-59-3-7196

Translation from: Referativnyy zhurnal. Metallurgiya, 1959, Nr 3, p 321 (USSR)

AUTHORS: Kudryavtsev, N. T., Mel'nikova, M. M.

TITLE: Electrolytic Deposition of Titanium From Aqueous Solutions of Its Salts (Elektroliticheskoye osazhdeniye titana iz vodnykh rastvorov yego soley)

PERIODICAL: Vestn. tekhn. i ekon. inform. Mezhotrasl. labor. tekhn.-ekon. issled. i nauchno-tekhn. inform. N-i. fiz.-khim. in-ta im. L. Ya. Karpova, 1958, Nr 1 (6), pp 21-22

ABSTRACT: A survey. The authors describe work on the deposition of Ti from aqueous solutions, beginning with work carried out in 1901 (deposition from organic materials in concentrated HCl); work on separation of Ti from Ti tartarate or mixed Ti-K oxalates and from a solution of Ti acid in water saturated with O₂; patented [proprietary] methods for separation from boron-fluoride electrolytes with addition of NH₃ and glue, from Ti³⁺ solutions in an alkaline electrolyte with addition of organic compounds; and work on the separation of Ti alloys (Cd-Ti alloy).

M. F.

Card 1/1

SOV/137-58-9-19575

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 9, p 206 (USSR)

AUTHORS: Kudryavtsev, N.T., Mel'nikova, M.M.

TITLE: Electrolytic Production of Hard Deposits of Iron From the Boron-hydrogen-fluoride Electrolyte (Elektroliticheskoye polucheniye tverdykh osadkov zheleza iz borftoristovodorodnogo elektrolita)

PERIODICAL: Nauchn. dokl. vyssh. shkoly. Khimiya i khim. tekhnol., 1958, Nr 1, pp 173-175

ABSTRACT: The effect of the composition of the boronfluorate solution and the conditions of the electrolysis on the quality of the deposition and the current efficiency (CE) of the yield of iron, also the buffering properties and resistance to oxidation were investigated. Electrolytes containing 100-150 g/l $\text{Fe}(\text{BF}_4)_2$ and 9, 12, and 18 g/l H_3BO_3 possess good buffering properties in the 3-4 pH range, which is probably caused by the reaction $\text{BF}_4^- + \text{H}_2\text{O} \rightleftharpoons \text{BF}_3\text{OH}^- + \text{HF}$, which proceeds upon the addition of alkali to the solution. H_3BO_3 increases somewhat the buffering properties of the electrolyte. A precipitate of $\text{Fe}(\text{OH})_3$

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SOV/137-58-9-19575

Electrolytic Production of Hard Deposits of Iron (cont.)

separates from the solution at pH 4.8-5.0. The electrolyte is stable to oxidation. Thus, upon stirring with compressed air (30 l/hour) for 72 hours at 20, 40, and 60°C the Fe^{3+} content accumulates to 5 g/l after which its concentration remains practically constant. The electrolyte with the greatest resistance to oxidation contains 300 g/l $\text{Fe}(\text{BF}_4)_2$. With an increase in the concentration of $\text{Fe}(\text{BF}_4)_2$ the quality of the coating varies little, but CE and the permissible cathode cd increase. At pH > 4.5 the deposit is dark and brittle, at pH 2-3 it is bright and soft, but CE is low. With an increase in temperature, CE and the permissible cathode cd increase, the color of the deposit changes from dark grey to silvery white, the hardness of the coating decreases. With an increase in cathode cd the CE and the hardness of the deposits increase. The following composition for the electrolyte is recommended (in g/l): $\text{Fe}(\text{BF}_4)_2$ 300, H_3BO_3 18, HBF_4 free 1-2, pH 3.2-3.6, temperature 20-60° and cathode cd 2-12 amp/dm². Coatings deposited under these conditions have a hardness of 420-600 kg/mm².

N.K.

1. Iron--Electrodeposition
2. Electrolytes--Properties
3. Electrolytes--Stability
4. Metal coatings--Mechanical properties

Card 2/2

SOV/137-59-1-554

Translation from Referativnyy zhurnal. Metallurgiya, 1959, Nr 1, p 73 (USSR)

AUTHOR: Kudryavtsev, N. T.

TITLE: Electrochemical Method for Preparation of Superfine Zinc Powder
(Elektrokhimicheskiy metod polucheniya dispersnogo poroshka tsinka)

PERIODICAL: Vestn. tekhn. i ekon. inform. Mezhotrasl. labor. tekhn.-ekon.
issled. i nauchno-tekhn. inform. N-i. fiz.-khim. in-ta im. L. Ya.
Karpova, 1958, Nr 3, pp 9-12

ABSTRACT: The author investigated procedures for electrolytic preparation of superfine and active Zn powder from waste products of the production of hydrosulfite, "rangolite," and benzidine. The Zn powder from the last two proved more active than imported Zn dust.

I. B.

Card 1/1

AUTHORS: Kudryavtsev, N. T., Tyutina, K. M. SOV/156-58-3-8/52

TITLE: The Cathodic Polarization in the Electrolytic Separation of a Tin-Nickel Alloy (Katodnaya polyarizatsiya pri elektro-osazhdenii splava olovo-nikel')

PERIODICAL: Nauchnyye doklady vysshey shkoly, Khimiya i khimicheskaya tekhnologiya, 1958, Nr 3, pp. 435 - 438 (USSR)

ABSTRACT: The presence of sodium and ammonium fluoride increases the cathode potential of tin to the point where it approaches the separation potential of nickel from chloride solutions. The potential in the simultaneous separation of tin and nickel at the cathode is a higher positive quantity than the potentials in the individual separation of tin and nickel. The course of the polarization curves in the separation of the alloy and its constituent parts from chloride-fluoride solutions was traced: based on an analysis of these curves it was found that the simultaneous deposition of tin and nickel on the cathode is accompanied by a considerable depolarization. The nature of the polarization was investigated according to various methods (suggested by Vagramyan and Gorbachev). It

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The Cathodic Polarization in the Electrolytic Separation SOV/156-58-3-8/52
of a Tin-Nickel Alloy

turned out that mainly chemical polarizations were concerned. This is due to the fact that the complex ions of the deposited metals are very stable. The experimental results obtained are illustrated in diagrams. They show the cathodic polarization in the electric separation of tin, nickel and the Sn-Ni-alloy (Diagrams 1 and 2); furthermore, the change of the cathodic potential with the period of electrolysis (Diagram 3), and the dependence of the $\lg J$ on $\frac{1}{T}$ at constant polarization values (Diagram 4). There are 4 figures and 4 references, 3 of which are Soviet.

ASSOCIATION: Kafedra tekhnologii elektrokhimicheskikh proizvodstv Moskovskogo khimiko-tekhnologicheskogo instituta im. D.I.Mendeleyeva (Chair for the Technology of Electrochemical Industries at the Moscow Chemical and Technological Institute imeni D.I.Mendeleyev)

SUBMITTED: January 29, 1958

Card 2/2

KUDRYAVTSEV, N. I.

AUTHORS: Moroz, I. I., Engineer, and Kudryavtsev, N. I., Doctor of Chemical Sciences. 129-4-5/12

TITLE: Influence of the relative content of NaCN and NaOH in zinc electrolytes on the mechanical properties of steels. (Vliyaniye odnositel'nogo soderzhaniya NaCN i NaOH v tsinkovykh elektrolitakh na mekhanicheskiye svoystva staley).

PERIODICAL: Metallovedeniye i Obrabotka Metallov, 1958, No.4, pp. 25-28 (USSR).

ABSTRACT: During electrolytic zinc coating in cyanide electrolytes a large quantity of oxygen separates out on the cathode. High carbon and engineering steels Y9 and 30X¹CA, which are heat treated to obtain a high strength, absorb easily hydrogen in the atomic form and this leads to increased brittleness. Usually degreasing and pickling do not influence the mechanical properties of the steel. In the case of the above mentioned steels zinc coating in a cyanide electrolyte reduces appreciably the ductility. Therefore, the authors studied the influence of the relative contents of cyanide and of alkali lye in cyanide electrolytes on the changes of the ductility of steels during zinc

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129-4-5/12

Influence of the relative content of NaCN and NaOH in zinc electrolytes on the mechanical properties of steels.

coating. The compositions of the tested steels and iron are entered in Table 1, p.26. The results are entered in tables and graphs. The following conclusions are arrived at:

1. An increase in the content of NaCN in the electrolyte brings about a deterioration in the mechanical properties of the tested steels and this deterioration is most pronounced for the number of bends until failure and the relative contraction. The lowering of the mechanical properties of steels during zinc coating in cyanide electrolytes is due to the penetration of hydrogen into the metal, the quantity of which increases with increasing concentration of the cyanide in the solution during electrolysis. The smallest change in the mechanical properties of the tested steels was observed after zinc coating in electrolytes containing 1 to 1.5 g-equiv/l of NaCN and 2.5-3 g-equiv/l NaOH for zinc concentrations of 1 g-equiv/l. There are 3 figures and 5 tables.

AVAILABLE: Library of Congress.
Card 2/2

VAGRAMYAN, A.T., prof.; KUDRYAVTSEV, N.T., prof.

Latest developments in electroplating. Khim. nauka i prom. 3
no. 4: 471-476 '58. (MIRA 11:10)
(Electroplating)

SOV/129-58-9-10/16

AUTHORS: Persiantseva, V. P., Kudryavtsev, N. T. and Kalb, V.M.

TITLE: Bright Copper Profiled Components Produced from Acidic Electrolytes (Blestyashcheye medneniye profilirovannykh izdeliy iz kislykh elektrolitov)

PERIODICAL: Metallovedeniye i Obrabotka Metallov, 1958, Nr 9, pp 42-46 (USSR)

ABSTRACT: Various authors have pointed out the possibility of producing a bright copper plating from cyanide and acidic solutions (Ref 1). Much attention to this problem is paid in an earlier paper of the team of the authors of this paper (Ref 2) in which it was shown that the most intensive component of an acidic electrolyte bringing about brightness is thiourea. However, if a certain amount of thiourea is present, the precipitates will be very brittle and unserviceable for layer thicknesses exceeding 5μ (Ref 3). V.G. Solokhina, N. T. Kudryavtsev and Lapatukhin, V.S. (Ref 2) proposed an electrolyte containing 250 g/litre CuSO_4 ; 5 H_2O ; 50 g/litre H_2SO_4 ; 0.005 g/litre thiourea and 0.5 g/litre sodium salt, 2.6 (and 2.7) naphthalene diacid which reduces the brittleness of the copper

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SOV/129-58-9-10/16

Bright Copper Profiled Components Produced from Acidic
Electrolytes

deposits resulting from the introduction of thiourea. This electrolyte was tested in the printing industry for copper cylinders intended for deep engraving. A current density of up to 10 A/dm^2 is permissible for depositing copper onto a rotating cylinder; during the process the electrolyte was agitated by means of compressed air. The temperature of the electrolyte should be 15 to 22°C and the produced coatings have a hardness up to 250 kg/mm^2 . As a result of investigations, the authors developed a regime of depositing the coatings on profiled components and a technique of purifying the electrolyte from the accumulating decomposition products. The data obtained in laboratory investigations were verified under shop conditions. The laboratory investigations were carried out in electrolytic baths of 1 and 6 litre capacity incorporating a rotating cathode. Low carbon steels with a total surface area of 0.2 dm^2 were coated and as anodes sheets of electrolytic copper were used. Depending on the current density, the duration of the

Card 2/5

SOV/129-58-9-10/16

Bright Copper Profiled Components Produced from Acidic Electrolytes

coating was varied in such a way as to obtain coatings of a thickness of about 20 μ . The pilot plant tests were carried out in a bath of 200 litre capacity, maintaining a bath temperature of 12 to 20°C. The concentrations of the sulphuric acid, the sodium salt and the thiourea were respectively 90, 0.5 and 0.005 g/litre; the current density was 3-10 A/dm², the temperature 12 to 20°C. As the brightness of the copper deposits decreased, thiourea was added. Naphthalene sulfonic acid was introduced at the rate of 0.04 to 0.06 g per Ah. The data given in the Table, p 43, show that, up to a certain current density, the copper deposits are bright for the electrolytes used in the experiments (CuSO₄·5H₂O contents of 146, 200 and 250 g/litre). With increasing concentration of the copper sulphate, the permissible current density for which bright deposits are obtained will increase somewhat. However, in a solution with an increased concentration of copper sulphate, a rapid saturation of the near anode layer takes place

Card 3/5

Bright Copper Profiled Components Produced from Acidic
Electrolytes

SOV/129-58-9-10/16

involving separation of copper sulphate crystals. Therefore, an electrolyte with an average copper sulphate concentration of 200 g/litre was used for which the optimum current density is 326 A/dm². Works experiments are also described. The 15 to 20μ thick copper layer is produced in 20 to 25 mins. If the specified technological regime is adhered to, the brightness of the copper coating produced from acidic copper electrolytes containing additions of brightening reagents will be at least as high as for mechanically polished coatings. The brightness of nickel deposited on such a copper layer will be higher than that of nickel deposited on a chemically polished or mechanically polished copper layer. At present in the Krasnyy Oktyabr' Works copper coating is effected only in accordance with this regime and this enabled improving the productivity and reducing the number of copper

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Bright Copper Profiled Components Produced from Acidic
Electrolytes

SOV/129-58-9-10/16

plating baths from 16 to 4.
There are 2 figures, 1 table and 3 references, 2 of
which are Soviet, 1 English.

ASSOCIATION: Moskovskiy khimiko-tekhnologicheskii institut
imeni Mendeleyeva (Moscow Chemical-Technological
Institute imeni Mendeleyev)

1. Copper plating--Test results 2. Electrolytes--Properties

Card 5/5

TYUTINA, K.M.; KUDICAVTSEV, N.T.

Anodic process in the electrodeposition of tin-nickel alloy
from a chloride-fluoride electrolyte. Zhur. prikl. khim. 31
no.7:1054-1058 J1 '58. (MIRA 11:9)
(Tin-nickel alloys) (Electroplating)

25(1)

PHASE I BOOK EXPLOITATION

SOV/3161

Nauchno-tekhnicheskoye obshchestvo mashinostroitel'noy promyshlennosti,
Kiyevskoye oblastnoye pravleniye

Zashchitno-dekorativnyye i spetsial'nyye pokrytiya metallov (Protective,
Decorative, and Special Coatings for Metals) Kiyev, Mashgiz, 1959. 291 p.
4,200 copies printed.

Editorial Board: P. K. Iavorko, N. I. Litvak, and A. P. Eychis (Resp. Ed.);
Ed. of Publishing House: M. S. Soroka; Chief Ed. (Southern Division,
Mashgiz): V. K. Serdyuk, Engineer.

PURPOSE: This book is intended for technical personnel in the field of protective
coatings for metals.

COVERAGE: The papers in this collection, presented at a conference of the NTO
Mashprom held in Odessa, deal with the mechanization and acceleration of
metal-coating and plating processes performed by spraying, electrolytic,
and other methods. Quality control of protective coatings is also discussed.
No personalities are mentioned. References follow several of the papers.

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Protective, Decorative, and Special Coatings for Metals

SOV/3161

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KUDRYAVTSEV N. T.

5(4) PHASE I BOOK EXPLOITATION SOV/2216
Sovetskoye no elektrokhiimii. 4th. Moscow, 1956.

Trudy... [sbornik] (Transactions of the Fourth Conference on Electromechanics: Collection of Articles) Moscow, Izd-vo AN SSSR, 1959. 868 p. Errata slip inserted. 2,500 copies printed.
Sponsoring Agency: Akademiya nauk SSSR. Otdeleniye khaticheskikh nauk.

Editorial Board: A. N. Frankin (Resp. Ed.), Academician, O. A. Yasin, Professor; S. I. Zhdanov (Resp. Secretary), B. N. Kabanov, Professor; S. A. Zhdanov (Resp. Secretary), B. N. Kabanov, Professor; Ya. M. Kolotyrkin, Doctor of Chemical Sciences, V. A. Losov, P. D. Lukatsky, Professor; T. A. Solov'yeva, V. V. Stender, Professor; and O. M. Florinovich, Ed. of Publishing House; N. G. Zagorov, Tech. Ed.; T. A. Frusakova.

PURPOSE: This book is intended for chemical and electrical engineers, physicists, metallurgists and researchers interested in various aspects of electrochemistry.

SCOPE: The book contains 127 of the 138 reports presented at the Fourth Conference on Electrochemistry sponsored by the Department of Chemical Sciences and the Institute of Physical Chemistry of the Academy of Sciences, USSR. The collection pertains to different branches of electrochemical kinetics, double layer theories and galvanic processes in metal electroposition and industrial electroplating. Thirty-two discussions are given at the end of each division. All the topics mentioned are given at the end of each division. References are given at the end of most of the articles.

Polukarov, Yu. M., and I. M. Gorbunova (Institute of Physical Chemistry, Academy of Sciences, USSR. Some Theoretical Problems on the Electrocrystallization of Alloys

Augubert, R.. (Deceased) (France). Mechanism of Anode Dis-
solution 410

Sutyagina, A.A., and K.M. Gortunova (Institute of Physical Chemistry, Academy of Sciences, USSR): Some Regularities of the Electrocrystallization of Metals Under the Influence of an Alternating Current.

Kalahev, R. Kinetics of Nuclei Formation During the Electrodeposition of Metals

Baymakov, Yu.-V. Kinetics of the Joint Discharge of Ions During the Electrolytic Deposition of Metals 427

Kudryavtsov, N.T., and K.K. Tutina (Institute of Chemical Technology, Leningrad). Cathodic Polarization During the Electrodeposition of a Tin-Nickel Alloy. 265

[illegible]

Levin, A.I. Role of a Cathode Surface Discharge and the Polarization of Passive Films in the Process of Metal Electrodeposition

Smaylov, A.V. (Institute of Chemical Technology Izem! D.I. Mendeleev). Kinetics of Cathodic Processes During the Electrodeposition of Metals From Aqueous Solutions 453

Card 18/34

S/123/60/000/017/007/016
A005/A001

Translation from: Referativnyy zhurnal, Mashinostroyeniye, 1960, No. 17, p. 130,
92534

AUTHORS: Kudryavtsev, N.T., Tyutina, K.M., Firger, S.M.

TITLE: Improvement of the Anticorrosion and Decoration Properties of Zinc Platings by Alloying Them With Nickel ✓

PERIODICAL: Tr. Mosk. khim.-tekhnol. in-ta im. D.I. Mendeleeva, 1959, No. 26,
pp. 96-104

TEXT: It is stated by investigations that bright lustrous deposits of Zn-Ni-alloy can be obtained from cyanide and ammine solutions. The composition of the cyanide electrolyte is (in g/l) : 32 Zn (in form of complex salts), 75-100 NaCN, 68 NaOH, 0.15-0.75 Ni (in form of cyanogen complex salt); the electrolysis proceeds at 20-25°C temperature and 1-3 amp/dm² current density, the yield of metal per current amounts to 96-80%; the Ni-content in the alloy is about 2%. The composition of the ammine solution is : 15 ZnO, 37-92 NiCl₂ · 6H₂O, 250 NH₄Cl, 20 H₃BO₃; the electrolysis conditions are as follows: pH 6.5-6.8, 40°C ✓

Card 1/2

S/123/60/000/017/007/016
A005/A001

Improvement of the Anticorrosion and Decoration Properties of Zinc Platings by Alloying Them With Nickel

temperature, current density $0.5-2 \text{ amp/dm}^2$, metal yield per current 99.97%; the Ni-content in the alloy amounts to 13-28%. Corrosion tests of the deposits showed that the platings of Zn-Ni-alloys have higher corrosion-resistance quality than the Zn-plating. As an example, an alloy with 2% Ni maintains its brightness in an atmosphere with a constant increased humidity and does not grow dark during a long time, an alloy with 25-28% Ni does not show corrosion marks after remaining in a 3%-NaCl-solution during 20 days.

S.V.M.

Translator's note: This is the full translation of the original Russian abstract.

Card 2/2

KUDRYAVTSEV, N.T.; BODROV, I.A.

Electrolytic chrome plating in solutions of trivalent chromium
salts. Trudy ~~MIHTI~~ no.26:105-112 '59. (MIRA 13:9)
(Chromium plating)

KUDRYAVTSEV, N.T. ; TYUTINA, K.M. ; BARABOSHINA, N.K.

Electrodeposition of the alloy tin-bismuth. Trudy ~~MEHTI~~ no.26:113-
119 '59. (MIRA 13:9)

(Tin-bismuth alloys)

KUDRYAVTSEV, N. T. ; TYUTINA, K. M. ; YARLYKOV, M. M.

Electrodeposition of the alloy tin-antimony. Trudy MKHTI no.26;120-
127 '59.

(MIRA 13:9)

(Tin-antimony)

S/081/60/000/007/007/012
A006/A001

Translation from: Referativnyy zhurnal, Khimiya, 1960, No. 7, p. 348, # 27349

AUTHORS: Kudryavtsev, N. T., Golovchanskaya, R. G., Mel'nikova, M. M.

TITLE: Electrochemistry of Titanium ✓

PERIODICAL: Tr. Mosk. khim-tekhnol. in-ta, im. D. I. Mendeleeva, 1959, No. 26,
pp. 128-136

TEXT: This is a review of the following problems: properties of Ti; ✓
standard Ti potential; H_2 overvoltage on Ti; electrolytes used for deposition
of Ti and its alloys (aqueous solutions of salts). There are 23 biblio-
graphical titles.

M. M.

Translator's note: This is the full translation of the original Russian
abstract.

Card 1/1

82694

S/081/60/000/007/008/012
A006/A001

18.7400

Translation from: Referativnyy zhurnal, Khimiya, 1960, No. 7, p. 348, # 27350

AUTHORS: Golovchanskaya, R. G., Kudryavtsev, N. T.

TITLE: Electrolytes for Titanizing

PERIODICAL: Tr. Mosk. khim.-tekhrol. in-ta, im. D. I. Mendeleeva, 1959,
No. 26, pp. 137-138

TEXT: It is stated that compact Ti deposits were obtained from aqueous-alcoholic hydrofluoboric and aqueous alkaline solutions. Silvery-ashen, dense Ti deposits were obtained at 20° and high D_0 . Current efficiency from alkaline electrolytes is 15 - 20% at the beginning of the electrolysis and decreases to 1.5% during 1.5 hours.

M. M.

Translator's note: This is the full translation of the original Russian abstract.

Card 1/1

KUDRYAVTSEV, N.T.

S/137/60/000/006/012/015
A006/A001

Translation from: Referativnyy zhurnal, Metallurgiya, 1960, No. 6, p. 321,
14015

AUTHORS: Golovchanskaya, R.G., Kudryavtsev, N.T.

TITLE: Electrolytes for Titanizing ✓

PERIODICAL: Tr. Mosk. khim.-tekhnol. in-ta im. D.I. Mendeleeva, 1959, No. 26,
pp. 137-138

TEXT: Information is given on results of investigations of electrolytes and conditions for titanizing. Best results were obtained by titanizing in aqueous alkaline solutions, producing lustrous deposits on an unpolished cathode surface.

L.A.

Translator's note: This is the full translation of the original Russian abstract.

Card 1/1

FILIMONOVA, G.V., mladshiy nauchnyy sotrudnik; KUDRYAVTSEV, N.T., doktor
khim. nauk; BELYAYEV, P.P., kand.khimicheskikh nauk.

Effect of organic additives on the solubility of lead in alkaline
lead electrolytes and their stability. Trudy NIIKHIMMASH no.28:55-60
'59. (MIRA 15:6)

(Lead plating)

FILIMONOVA, G.V., mladshiy nauchnyy sotrudnik; KUDRYAVTSEV, N.T., doktor
khimicheskikh nauk, prof.; BELYAYEV, P.P., kand.khimicheskikh nauk.

Cathodic process in lead electroplating from alkaline electrolytes.
Trudy NIIKHIMMASH no. 28:61-77 '59. (MIRA 15:6)
(Lead plating)

KUDRYAVTSEV, N. T.

In W. Burkhardt's article "Korrosionsschutz durch galvanische Metallueberzuege" the following reference is made:

Kudryavtsev, N. T., Moskau: Elektrolytische Ueberzuege aus Zn-Ni-Legierung als Korrosionsschutz fuer Stal'erzeugnisse, Referat z. Int. V. Kolloquium der Hochschule fuer Elektrotechnik Ilmenau, Oktober 1960.

EO: Chemische Technik, May 61, p. 263, Uncl.